

Winter Air Quality Monitoring

Yellowstone National Park

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Preliminary Summary

Carbon monoxide

- CO measured at the West Entrance was the highest of the three measurements sites, but maximum concentrations were below the EPA National Ambient Air Quality Standards.

Max. 1-hr CO	25% of NAAQS
Max. 8-hr CO	37% of NAAQS

- CO was observed to peak in the morning and again in the afternoon, the highest peak being in the morning. This followed the snowmobile traffic counts. Prior to opening of the park road to snowmobiles, only a very small daytime increase in CO was observed (< 10% of the average during snowmobile usage).
- CO and particulate matter (PM_{2.5}) correlated strongly. PM_{2.5} relates to visual impact. Emission of visible plumes could be observed in some of the digital images of the road.
- CO concentrations observed in winter 2002-2003 are lower than reported maximum values in 1995 or 1999. Partly this is due to the difference in sampling location.

Particulate matter (PM_{2.5})

- PM_{2.5} maximum concentrations at the West Entrance were 19% of the 24-hr standard. However, all of the emission and high concentrations are during the day and concentrations are near the regional background at night.
- Higher concentrations of PM_{2.5} were observed at Old Faithful (57% of the PM_{2.5} NAAQS). The two-peak pattern during the day was observed to be similar to the pattern at the entrance station.
- Visual range was affected on some days at Old Faithful such that visual range was reduced to approximately 32 km (snow days and foggy days were excluded).
- Maximum PM_{2.5} concentrations reported for 1999 appear to have been higher at the West Entrance, however, the averaging periods reported are not the same which makes a direct comparison difficult.

Further analysis to relate the CO and PM to snowmobile counts and different weather conditions is incomplete at this date. Further comparisons to CO data collected by the State of Montana in prior periods and to model expectations will be included in the final report.

Summary and Comparison of Stations

Three winter monitoring stations in Yellowstone (2) and Grand Teton (1) were operational in the third week of Dec. 2002. The table on the right summarizes particulates as PM 2.5 and carbon monoxide (CO) concentrations for time periods relevant to the national standards for the initial weeks of the study.

The pre-Dec. 28th period can be considered a background for the West Yellowstone area. PM2.5 values had a high variability for the area and some night time spikes that are most likely wood smoke. A large increase in CO was observed as soon as the West Entrance was opened to snowmobiles.

None of the observed pollutants exceeded the national standards during the reporting period. The West Entrance has larger CO concentrations than either the Flagg Ranch or Old Faithful areas. In contrast, the Old Faithful area has greater PM2.5 values; sometimes much greater values. Wood smoke or another unknown source appears to be emitting at Old Faithful.

Preliminary observed data for Dec. 19, 2002 to Jan. 12, 2003 (Initial 4 weeks)

Park	Location	ug/m3 Max 1-hr PM2.5	ug/m3 Max 24-hr PM2.5	percent of Std PM2.5	ppm Max 1-hr CO	percent of Std CO	ppm Max 8-hr CO	percent of Std CO
YELL	West Entrance	12	12	19%	7.9	23%	3.4	38%
YELL	Old Faithful	200	43	66%	1.1	3%	0.5	6%
GRTE	Flagg Ranch	8	8	12%	5.4	15%	1.5	17%
YELL	WE-(pre Dec28)	8	8	13%	0.7	2%	0.5	5%
NAAQS Standard			PM2.5		CO		CO	
	1-hour	--	--		35		--	
	8-hour	--	--		--		9	
	24-hour	--	65		--		--	

- The table contained raw data with some invalid data edits and baseline corrections. Final data may vary slightly.

Summary of results from 3-month monitoring period

Park	Location	ug/m3 Max 1-hr PM2.5	ug/m3 Max 24-hr PM2.5	percent of Std PM2.5	ppm Max 1-hr CO	percent of Std CO	ppm Max 8-hr CO	percent of Std CO
YELL	West Entrance	--	15	23%	8.6	25%	3.3	37%
YELL	Old Faithful	--	37	57%	2.9	8%	1.2	13%
GRTE	Flagg Ranch	--	8	13%	4.7	13%	1.7	19%
YELL	WE-(pre Dec28)	8	8	13%	0.7	2%	0.5	5%
NAAQS Standard			PM2.5		CO		CO	
	1-hour	--	--		35		--	
	8-hour	--	--		--		9	
	24-hour	--	65		--		--	

Visibility at Old Faithful based on nephelometer (b_{scat}) measurements

Visibility metric	b_{sp} (Mn^{-1})	Visual Range (km)
Mean of cleanest 20% days	2.1	< 323 km
Mean of all data	28.2	< 101 km
Mean of dirtiest 20% days	111.2	< 32 km